IEA/SolarPACES Task I Meeting:
Solar Thermal Electric Power Systems

March 9, 1995
PSI, Villigen, Switzerland

Meeting Summary

An IEA/SolarPACES Task I Meeting on Solar Thermal Electric Power Systems was held in conjunction with Task II and III meetings at the Paul Scherrer Institut in Villigen, Switzerland. The objectives of the meeting were to review the status of ongoing Task I activities and evaluate other activities of task participants (particularly those previously discussed in Moscow) as potential future task activities that would expand international cooperation within Task I. Other objectives included identifying new sector leads (Michael Geyer, DLR, and/or Wesley Stein, Pacific Power for Sector 1 and Tom Mancini, Sandia, Sector 2) and individual leads for specific activities. An updated meeting agenda, attendees list, and presentation summaries are attached.

Summary of Potential Task I Activities

Based on presentations at the meeting, a number of potential new activities (with potential leads in parentheses) were identified:

Possible new cooperative activities:

Expanded KJC O&M activity to include consulting for new plant designs (Cohen)
Comparative dish/Stirling Systems testing/evaluation at PSA (Grasse) and Obninsk (Loktionov)
Direct Steam System Comparison (Meinecke)
SOLGAS review (Blanco)
Tennant Creek review (Stein)
Kislovodskaya Solar Power Station review (Mancini for dish/Stirling; Grasse for PV)

Less likely joint activities:

DISS (Sector head will investigate possibility of cooperation)
Solar Two joint evaluation (will be pursued at the time of a California meeting)

Expanded reporting activities (as allowed by intellectual property considerations):

SBP dish/Stirling Systems (Schiel)
DISS (M. Sanchez)
Dead Sea Works/MDAC activities (Epstein)

Some of these activities may be formalized into Task I cooperative activities, depending on the level of interest of potential participants.

The table below provides a snapshot of Task I at this time, including all activities either currently underway or under consideration as new (with potential new activities in bold type). Cooperative activities are those involving more than one country as active participants, while information-sharing activities are those where the participants have agreed to provide regular informational updates to the Task. The results of progress in organizing the new activities will be reported at the May IEA Executive Committee meeting in Australia by Craig Tyner.

Task I: Electric Power Systems (C. E. Tyner, Operating Agent)

(Potential new activities in bold)

Sector 1. Central Generation Systems (M. Geyer and/or W. Stein, Sector Leader)

Cooperative Activities:

O&M Cost Reduction (KJC; **expanded to include O&M consulting for new activities**)
Direct Steam Generation System Comparison (Meinecke, DLR)
SOLGAS Review (Blanco, SODEAN)

Information-Sharing Activities:

Solar Two (Sandia, U. S. utility consortium; **cooperative evaluation under consideration**)
Phoebus/TSA (Phoebus consortium)
DISS (Sanchez, CIEMAT; cooperative participation under consideration)
Dead Sea Works/MDAC Systems (Epstein, WIS)

Sector 2. Distributed Generation Systems (T. R. Mancini, Sector Leader)

Cooperative Activities:

Dish/Brayton Demonstration (Sandia, NREC, DLR)
Dish/Engine Compendium (Cal Poly, Sandia, all others with input)
Comparative dish/Stirling testing and evaluation at PSA and Obninsk (Grasse, DLR)
Tennant Creek Review (Stein, Pacific Power)
Kislovodskaya Solar Power Station Review (Mancini, Sandia (d/S); Grasse, DLR (PV))

Information-Sharing Activities:

Dish/Stirling Joint Venture Program (Cummins, Sandia)
Utility-Scale Joint Venture Program (Cummins, SAIC, Sandia)
SBP Systems Testing and Development (Schiel, SBP)

Detailed Meeting Minutes

After agreement on minor changes to the Task I agenda (attached, as corrected) and the tentative new Sector Leaders (Michael Geyer, DLR, and/or Wesley Stein, Pacific Power for Sector 1 and Tom Mancini, Sandia, Sector 2), reports of ongoing Task I activities were presented.

Ongoing Activities: Sector 1. Central Generation Systems

Michael Geyer chaired the Sector 1 Central Generation Systems.

Gilbert Cohen, KJC, presented the status of the ongoing KJC/Sandia **O&M Cost reduction contract**, with an emphasis on combined reducing of costs and increasing of performance. He also emphasized that having experience with conventional power blocks does not necessarily carry over to solar plants. At a more detailed level, he described the $40M in savings realized by the work to date and the potential use of a detailed HCE model as an input module to the TRNSYS development activities presented in Task III by DLR. Finally, Cohen summarized the willingness of KJC to consult for the STE industry on any future plant development. Who would pay and how payment would be provided was not addressed, although it is clear that major activities would require direct support from the users.

Next, Craig Tyner summarized the status of activities at **Solar Two**, emphasizing the ongoing construction. The decision by the Steering Committee to require a significant contribution (likely a full $1M) in order to allow active IEA/SolarPACES participation in the test and evaluation activities was also discussed, although the value of international exposure that could be gained for the technology was offered as a counter argument. It was agreed that Tyner would continue to pursue involvement of the IEA at Solar Two, with the next steps to be taken in the spring (or fall) when the EC meets in California.

Wlifried Grasse described the status of the **Phoebus** consortium in Europe. There are no near term opportunities in Jordan, and without obvious commercial possibilities or financing strategies, little is happening. Grasse said they would like to pursue a build-startup-transfer (BST) model in looking for opportunities. Right now they have only low level plans for upgrading and utilizing the TSA system, and a poor response from the consortium's partners has limited progress.

Ongoing Activities: Sector 2. Distributed Generation Systems

Tom Mancini, leader for Sector 2 Distributed Systems, chaired the remainder of the morning session on ongoing activities.

Reiner Buck, DLR, presented the status of the task-shared **dish/Brayton** project involving NREC, DLR, Sandia, and Cummins (who considers the system a backup to their Stirling engine). In operation, the recuperation (the most critical system component, 92% efficiency is expected) heats incoming compressed air to 600C, followed by solar

and/or hybrid heating to 900C. Hybridization is an inherent part of the system and, as such, represents a major advantage over dish/Stirling hybrid systems. The engine is fabricated from off-the-shelf turbocharger parts. Engine efficiency is expected to be ~30%. More than 100 hours of cogeneration operation have been accumulated on a 60 kW system to date. Recuperator leakage has been an issue, partially as a result of thermal cycling. DLR testing of the VOBREC-2 receiver has demonstrated 83 kW at 870C, 3 bar, with efficiency of 78 to 86%. The silicon-nitride absorber was very brittle, so new systems will utilize silicon carbide in its place. The VOBREC-4 receiver for testing at Sandia will have 60 kW capacity matched to the TBC with a 22 cm receiver aperture diameter. While DLR has used secondary concentrators in testing the VOBREC receivers, secondaries will not be used for the TBC and Cummins dishes. The VOBREC-5, which will be used on the Cummins system, will be 100 kW receiver.

Tom Mancini presented the status of the **Cummins DSJV** program. The possible joint testing (DOE/DLR) of a CPG 7 kW system at the PSA is still under consideration. Cummins has expressed interest and could potentially benefit from the exposure in the Mediterranean area. PSA would provide testing; CPG would provide the system (although they don't yet know how they would fund the system). Another offer includes the possible installation of a CPG engine on a SBP dish, depending on interest.

Wolfgang Schiel presented the status of the **SBP systems**. They are currently designing a new generation dish/Stirling system, which includes dish refinements and the next-generation engine. The plan is to install three of the new systems for testing at the PSA in January of 1996 in cooperation with L. & C. Steinmuller. The next goal is to produce 100 systems (nearly 1 MW_e) to reduce costs to < 100 DPf/kWh to beat PV (Seimens estimate of 180 DPf/kWh). Wilfried Grasse then discussed the test capabilities of the PSA for dish testing and comparisons (related to CPG above). He suggested that this comparative testing become a Task I activity.

A few facts on the current operation of the **SBP systems at Almeria**. More than 18,000 hours of systems operation have been logged at the PSA with 5000 maintenance-free hours on a single engine. System efficiencies are on the order of 18% solar to electric. The new engine design is approximately 1/2 the weight of the previous generation's design and operates at an increase of approximately 2 points in efficiency. Only 150 hours of operation on the new engine have been logged as of early March. The plan is to deploy these systems in cogeneration units as well as dish/Stirling modules. Schlaich is also interested in producing a 25 kW_e system but has not identified an engine.

Tom Mancini then presented the status of the two **USJV programs**. Grasse brought up the issue of on-site fabrication (SBP) vs. factory fabrication (SAIC, CPG) of the concentrator. Schiel emphasized the importance of limiting field alignment in design, which is one benefit of on-site fabrication of a single-element dish design. The bottom line is that the decision will depend on installation size -- MW vs. a dish or two.

Tom Mancini then presented the status of Bill Stine and Rich Diver's **dish/engine compendium** activity, including expansion to dish/Brayton and new activities (USJVP, new SBP systems, Russian work). One comment addressed the nominal test temperature (15 C vs. 25 C standard used for PV vs. 15 C for diesel and turbine systems).

Tyner then presented a brief status of the **NSEZ**. There was considerable skepticism that 5.5c/kWh, as proposed by ENRON, could be done. Michael Epstein pointed out, however, that a few million subsidy from a $1B company like Enron was not impossible.

To complete the morning session, Carl Winter discussed his recent activities in a German Atmospheric Protection Commission (**global warming**). The Commission sat for the 11^{th} and 12^{th} sessions of the Bundestag and convened a Conference in Berlin last Fall. A number of "findings" and recommendations came out of the conference including: a 60-80% reduction in today's CO_2 release would have to be eliminated to maintain global temperature rises to 0.1 C/decade, the value that the Commission identified as their target; Germany should try by 2020 try to halve the use of carbon energy use and to double the efficiency of energy use; and by 2050 Germany should strive for an energy mix that includes 1/4 fossil fuels, 1/4 solar, and 1/2 renewables, such as nuclear, wind, hydro, biomass, and geothermal energy. Energy efficient buildings could, with today's technology, reduce energy consumption by up to 80%, with similar savings for transportation efficiency. These recommendations were made to the Bundestag but no decision has been made on whether or how to implement them.

Potential New Activities: Sector 1. Central Generation Systems

Following a break for lunch, the group reconvened to discuss potential new activities in Task I.

Manuel Sanchez presented a proposal for Eduardo Zarza to pursue DSG activities within Task I. PSA expects a significant cost reduction from DSG over other trough plants, and this is the incentive for their pursuing Direct Steam Systems **(DISS)**. In the DISS Project, the Spanish are investigating several alternatives for generating steam including: once-through generation, water injection, and boiler/superheater sections of the field. They expect different levels of difficulty and potential benefits from each of these options. PSA's plan calls for the installation of the first DISS loop by late in 1996 and the installation of a second section of the field in 1998. The total program cost is 12.5 MECUs over six years with 6 MECU spent during the first two years. Potential contributors include 10 companies/industries, Endesa, Solel, Seimens (most in the form of cash contributions). DLR and CIEMAT are also contributing a combined 1.2 MECUs to the project. Because the project involves funding by private industry, the sharing of information with non-participants will be limited. A decision was reached to assign an action item to the Sector Head to investigate the feasibility of formalizing a Task I activity, once the DISS steering committee for the project is in place and can address some of these issues.

<u>Action Item 030995-1</u>: Sector Head (Geyer) to investigate the feasibility of formalizing a Task I activity for the DISS Project. This is probably best pursued once the DISS Steering Committee is in place and can address some of the key issues.

Wolfgang Meinecke presented a proposal for a project to evaluate and compare the performance of **direct steam generation systems**, such as the ANU dish, DSG trough, central steam receiver, etc. He clearly limited the scope of the project to those systems that produce superheated steam only, thereby eliminating saturated steam systems such as SOLGAS. Activities in this project include first defining the goals of the project, identifying systems and experts to be involved, forming consensus guidelines, defining common tools and methods, developing technical and cost data, comparing results, and making recommendations. The methodology would be very similar to the 2nd generation central receiver study. The proposed first step is to start with a system like the ANU dish system, adding STEM/DISS as data becomes available. The proposed project time frame is about 2 years, possibly lasting longer if data are not available. DLR--Koln would lead the activity with help from SNL (OA and Kolb); system representatives would provide data from their systems; SOLERGY and reliability analysis support provided by Sandia, DLR--Koln, and others. It was agreed that DLR (Wolfgang Meinecke) will take the lead and that project participants will include: SNL, Australia, Schmitz-Goeb (Steinmuller), IVTAN (Shpilrain for now). This group will develop the initial working issues and report back at the next Task meeting on a formalized activity.

<u>Action Item 030995-2</u>: Wolfgang Meinecke will take the lead on <u>Direct Steam Generation System Evaluation</u>; project participants will include: SNL, Australia, Schmitz-Goeb (Steinmuller), IVTAN (Shpilrain for now). This group will develop the initial working issues and report back at the next Task meeting on a formalized activity.

Manual Blanco presented the **SOLGAS** project and expressed the desire to have a technical review of the proposed project by a panel of experts. The project participants are Sodean, Sevillana, EDP, CIEMAT, DLR, Abengoa, INETI, ZSW. The project kickoff meeting was Jan 19, 1995. A review is requested in order to assure success of the project. Possible reviewers include Kolb, Cohen, Fricker, Shadrin, Schmitz-Goeb, Bechtel or other U.S. industry (for heliostat, receiver costs).

<u>Action Item 030995-3</u>: Manuel Blanco will coordinate a team of reviewers for the <u>SOLGAS Review</u> and develop an action plan for presentation at the next Task meeting.

Michael Epstein presented the **MDAC, WIS**, and industry activities for a Cassegrain-type **central receiver air system** with storage for powering a gas turbine system. Initial activity will be a 1 MW test at WIS. He also described the **DSW project** for processing chloride salts, which requires process heat at 850C and will probably use a Cassegrain-type system as well (44 MWt). A possible variation of the system involves beam splitting between the thermal and pv parts of the spectrum, and solar cracking/syngas production is also an option. No decision has yet been made as to whether or not the project will

proceed. The project has a 40% subsidy from government for the industrial agreement, plus 5-6% allowance for using renewables to replace fossil fuels. In addition, there is a plan for installing an ANU dish at Sde Boqer for testing.

Potential New Activities: Sector 2. Distributed Generation Systems

Glen Johnston described the **Tennant Creek** project in Australia, which will produce energy for 18 to 20 c/kWhr including capital cost estimates. Critical issues include control of DSG boilers, dish layout, dish manufacturing costs, diurnal, transport, and startup losses. In the scale-up study, dish/Brayton may be considered (a potential opportunity for NREC). He proposed an IEA/SolarPACES review of the feasibility study (March to June) and scale-up study (April to June). Possible reviewers might include Stine, Geyer for DISS, SNL, Roy, Cohen. This could possibly be done by a committee reviewing several projects. Cooperation with DISS would be very valuable.

Action Item 030995-4: Wes Stein will lead the activity to review the proposed Tennant Creek Project. Tom Mancini will work with Wes to identify members of the review panel and help coordinate activities.

Action Item 030995-5: Wes Stein will also lead the activity to review the Scale-Up Study for the "Big" Australian Dish. Tom Mancini will work with Wes to identify reviewers and help to coordinate activities.

Vadim Shadrin discussed the **Kislovodskaya Solar Power Station**. Kislovosk is located in the northern Caucasus (300 km from Grozny!) The plant contains 54 dual dish/Stirling modules comprising about 10 kW_e per module, 4-6 kW_e for each of two engines at 13-18% efficiency and 240 photovoltaic/water heating modules. Development is scheduled in 95-96, building foundations in 97, supply of equipment in 98. Prof. Shadrin is requesting a review of the project by a panel of experts. The Sector Leader will assemble a panel to review the dish/Stirling systems. Wilfried Grasse volunteered to contact David Faiman and Mark Koltun at Sde Boqer about reviewing the plans for the pv/thermal part of the system.

Action Item 030995-6: Tom Mancini will assemble a review panel to evaluate the plans for the dish/Stirling systems at the Kislovoskaya Solar Power Station. He will coordinate with Vadim Shadrin the procedures, dissemination of information, and compilation of the results. Progress will be reported at the next Task I meeting.

Action Item 030995-7: Wilfried Grasse will contact David Faiman and Mark Koltun to see if they are willing to help perform a review of the pv/thermal part of the Kislovoskaya Plant. He will report his findings to Tom Mancini prior to the next Task I meeting.

Finally, Dr. Eduard Tverianovich described a new concept of an "Enclosed Type" (ET) solar plant. The concept makes use of refractive, Fresnel-type optical elements as the roof of a building. Secondary concentrators within the building concentrate the energy at

a fixed point. Concentration ratios are reported to be 300 for a trough configuration and up to 2500 for a dish configuration. Trough optical efficiencies are predicted at 0.66 and dish optical efficiencies at 0.56. Overall system efficiency of 0.18 is anticipated. Lifetime is expected to be 40 or 50 years. Compared to a SEGS plant, land area can be much less, concentration ratio much higher, overall performance similar. Compared to dish/Stirling system, overall efficiency is much lower. A test module 6m by 2m by 2m could be done to demonstrate technology and allow a plant design and evaluation. Dr. Tverianovich proposes that IEA Solar PACES cooperate to develop and test a demonstration system. He estimated installed cost of materials is $1700/kW for a small module.

Summary

In summary, Craig Tyner assembled a list of activities (see introduction) that were agreed by the Task I participants to warrant further consideration.

Action Items Summary

Action Item 030995-1: Sector Head (Geyer) to investigate the feasibility of formalizing a Task I activity for the DISS Project. This is probably best pursued once the DISS Steering Committee is in place and can address some of the key issues.

Action Item 030995-2: Wolfgang Meinecke will take the lead on Direct Steam Generation System Evaluation; project participants will include: SNL, Australia, Schmitz-Goeb (Steinmuller), IVTAN (Shpilrain for now). This group will develop the initial working issues and report back at the next Task meeting on a formalized activity.

Action Item 030995-3: Manuel Blanco will coordinate a team of reviewers for the SOLGAS Review and develop an action plan for presentation at the next Task meeting.

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Action Item 030995-6: Tom Mancini will assemble a review panel to evaluate the plans for the dish/Stirling systems at the Kislovoskaya Solar Power Station. He will coordinate with Vadim Shadrin the procedures, dissemination of information, and compilation of the results. Progress will be reported at the next Task I meeting.

Action Item 030995-7: Wilfried Grasse will contact David Faiman and Mark Koltun to see if they are willing to help perform a review of the pv/thermal part of the

<u>Kislovoskaya Plant</u>. He will report his findings to Tom Mancini prior to the next Task I meeting.

IEA/SolarPACES Task I: Electric Power Systems

Task I Meeting

Paul Scherrer Institut
Villigen, Switzerland
March 9, 1995

Agenda (Post-Meeting Update)

Status of Ongoing Activities

Sector I.1: Central Generation Systems — Tyner, acting

8:30 am **I.1.A O&M Cost Reduction** — **Cohen, KJC**

The KJC/SNL O&M cost reduction program has continued to make substantial progress into FY95, including installation of a state-of-the-art maintenance planning software system, detailed efficiency analyses of historical data, and development of improved instrumentation and hardware. KJC has estimated net-present-value savings of over $40M based on results to date. — KJC, Sandia

Possible expansion to include any appropriate O&M consulting for IEA/SolarPACES partners has been proposed by KJC. — KJC, anyone

I.1.B Solar Two — **Tyner, Sandia**

Solar Two is midway through its Phase IV: Construction. Major salt components (receiver, storage, steam generator) are being fabricated, and converted heliostats are being installed. Foundations for major conponents have been installed. Start-up is planned to begin in the fall. — Solar Two Consortium, Sandia,

M. Haeger has proposed including TSA experience in the Solar Two evaluation. — DLR/PSA?, plus above

I.1.C PHOEBUS/TSA — **Grasse, DLR**

Update of activities since Moscow. — DLR, TSA consortium

Potential reinitialization of activity — ?

World Bank/GEF & ISCCS Mexico Project Status — **Tyner for Washom**

Summary of Byron Washom's (Spencer Management) 10/94-1/95 Quarterly ISCCS Mexico Status Report

Sector I.2: Distributed Generation Systems — Mancini, Sandia

10:00 am **I.2.A Dish/Brayton Demonstration** — **Buck, DLR**

A Brayton solar generator is currently being developed as part of an international project. Northern Research and Engineering Co. of Woburn, MA, USA, is developing the Brayton engine, which is based on readily-available turbocharger parts. The DLR is developing a volumetric receiver for the system. And Sandia National Laboratories is providing design assistance and will test the system at the U. S. NSTTF during 1995. — NREC, DLR, Sandia

I.2.B Dish/Stirling Joint Venture Program — **Mancini, Sandia**

Phase II of Cummins Power Generation's 7 kWe dish/Stirling project was completed in 1994. The project schedule was impacted by the selection in late 1993 of the CFIC opposed free-piston Stirling engine as the primary solar engine for the sytem. During the next year, eight systems will be fabricated and deployed at sites around the SW United States. — Cummins, Sandia

Status of SBP Dish/Stirling Activities at PSA — **Schiel, SBP**

Update on results and plans for SBP testing at the PSA and for new systems

I.2.C Utility-Scale Joint Venture Program — **Mancini, Sandia**

Two teams, one lead by Science Applications International Corporation of Golden, CO, USA, and the other by Cummins Power Generation of Columbus, IN, USA, are — SAIC, Cummins, Sandia

currently in the midst of Phase I of the USJV Program. The objective of Phase I is to produce the initial prototypes for dish/Stirling systems for grid-connected operation.

I.2.D Dish/Stirling Compendium — TRM/Stine, Cal Poly

The initial Dish/Stirling Compendium was produced in 1993 by W. B. Stine and R. B. Diver. Future plans include updating the Compendium to include new dish/Stirling projects and Brayton engines.

Cal Poly with input from all IEA/SolarPACES participants with dish/engine experience

Status of the U. S. NSEZ Activities — Tyner, Sandia

The Nevada Solar Enterprise Zone will provide an opportunity for early installations of solar systems in Southern Nevada. Tyner presented a summary of the current status.

German Government Activities Impacting Global Warming — Winter

Winter presented the status of his work on a task force providing recommendations to the German government on possible actions to reduce potential effects of global warming.

Potential New Activities

Sector I.1: Central Generation Systems — Tyner, acting

1:00 pm DSG Coordination — Sanchez for Zarza, CIEMAT

DLR, CIEMAT, Israel, ?

A number of trough/direct steam generation projects are underway in Europe and Israel. Coordination of and/or sharing information from these activities to assure maximum benefit to all participants has been proposed.

Steam System Comparisons — Meinecke, DLR

DLR, Sandia, ANU/Pacific Power, ?

There was considerable interest in Moscow on a cooperative project to compare various solar thermal technologies (Phoebus, Solar One, Trough DSG, ANU dish, etc.) on a comparable basis (e.g., cost of steam).

SOLGAS Project Review — Blanco, SODEAN

SODEAN, CIEMAT, DLR, Sandia,?

The main goals of the SOLGAS project are to design, construct, and operate a hybrid (sol-gas), combined cycle, cogeneration plant based on central receiver technology in Southern Spain. Under design conditions, the SOLGAS Plant being considered would supply 35 MW_e to the grid and would provide 39 t/h saturated steam at 18 bar as process heat. A heliostat field would provide the solar contribution. Under design conditions, the field would provide 25 MW_t to a central receiver operating at 106 bar and producing approximately 40 t/h of saturated steam. SOLGAS Review is a proposed activity under the IEA Solar PACES Task 1 for a "technical audit" of the project by a panel of international experts.

Status of Israeli Power Tower Activities — Epstein, WIS

The status of the Dead Sea Works project and a new activity with MDAC for a gas turbine power tower system were presented.

1-MW Kippod Receiver System Test (deleted) — Haegar, DLR

WIS, PSA, Sandia

To support development of integrated solar combined cycle power tower systems, a PSA test of a 1-MW Kippod receiver has been proposed. The PSA field offers the configuration needed for such a test, which could be conducted jointly by interested parties.

Advanced Power Tower Control Systems (deleted) — Haegar, DLR

PSA, DISEL, ?

Some system-level development is required for advanced control systems for power tower plants (dynamic aiming, field/receiver interactions, etc.) that could benefit all power tower systems.

Heliostat Purchase Coordination — ?

SODEAN, WIS?

Is there any reason for us to try to coordinate through the IEA/SolarPACES the purchase of heliostats for large international projects? What specifically would we do and how would we handle this? What would be the benefits? Who would coordinate/participate?

Sector I.2: Distributed Generation Systems — Mancini, Sandia

2:30 pm	**Tenant Creek Project Review** The Tenant Creek Project will build, install, and test a number of large ANU dishes in a central steam turbine system. Reviews of the project plans and progress have been requested by Australia.	**Stein, Pacific Power** Pacific Power, ANU, DLR, Sandia
	Cummins Test at PSA (Changed to Comparative Testing) Cummins has or will have up to 10 dish/Stirling systems under test over the next few months. Testing of one of their systems at the PSA would allow comparisons with European systems and be a showplace for Cummins in Europe. Grasse expanded the proposal to include a comparative test environment for dish systems at the PSA.	**Grasse, DLR/PSA** PSA, Cummins, Sandia
	Kislovodsk Plant Project Review A review of the proposed Russian plant by IEA/SolarPACES has been requested.	**Shadrin, Astrophysica** Astrophysica, IVTAN, DLR, Sandia,
	"Enclosed Type" Solar Power Plant A review of the proposed Russian plant by IEA/SolarPACES has been requested.	**Tverianovich, SPP-ET** ?
	Commercialization Factors Do we want to pursue this? What does it really mean? Are there common economic analyses that we should apply or common problems we could address? Should we develop a common set of economic assumptions for comparison of the various options?	**?** DLR, Sandia, CIEMAT?

Additional Business

4:00 pm	**Sector Leaders** Current IES/SolarPACES agreement calls for Sandia sector lead for Sector 1, and DLR lead for Sector 2. It appears that switching these two might be beneficial because of emphasis of current activities. Tom Mancini has agreed to serve as Sector 2 leader if appropriate. The lead for Sector 1 needs to be established.	**Tyner**
	Next Meeting	**All**
	Action Items	**All**

Adjourn

IEA/SolarPACES

Task I: Electric Power Systems

Task Meeting Summaries:

Paul Scherrer Institut, Villigen, Switzerland	**9 Mar 95**
Uzkoe Hotel, Moscow, Russia	**25 Sep 94**

Craig E. Tyner
Sandia National Laboratories

Operating Agent, Task I

Sandia National Laboratories

Albuquerque, New Mexico 87185-0703

November 19, 2001

IEA/SolarPACES Task I Participants:

Since I assumed responsibility as Operating Agent for IEA/SolarPACES Task I: Electric Power Systems in March, 1994, we have had two task meetings: one in Moscow in November, 1994, and one in Villigen, Switzerland in March, 1995. Please find enclosed my summaries of these meetings.

As a result of these meetings, we have identified a number of potential new cooperative activities within Task I. The list below provides an unofficial snapshot of Task I at this time, including all activities either currently underway or under consideration as new (with potential new activities in bold type).

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Sector 1. Central Generation Systems (M. Geyer and/or W. Stein, Sector Leader)

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Sector 2. Distributed Generation Systems (T. R. Mancini, Sector Leader)

Cooperative Activities:

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Information-Sharing Activities:

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Utility-Scale Joint Venture Program (Cummins, SAIC, Sandia)
SBP Systems Testing and Development (Schiel, SBP)

I will continue to work with the Sector Leaders and Activity Coordinators to facilitate formalization of the potential new activities, including presenting a status report to the Executive Committee in May. Thanks for your active participation in Task I activities and for helping expand our areas of cooperation.

Sincerely,

Craig E. Tyner
Operating Agent, Task I

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Task I Meeting Summaries

IEA/SolarPACES Task I Distribution

[The Access Database needs to be updated to include all the individuals on the following page (the Task I Fax list), with a separate listing for each name. Get current addresses from the two attached lists (the PSI list is newer and has priority); enter into database (update existing if available), checking master list category and a new category ("IEA/SP Task I"); enter phone and fax where available. See me for any missing addresses and to proof list. This distribution will then include the new "IEA/SP Task I" category only. Thanks. CET]